

**401 KAR 48:207. Petroleum-contaminated soil treatment facility liner geosynthetic quality assurance and quality control.**

RELATES TO: KRS 224.01, 224.10, 224.40, 224.43, 224.99, 322.010(16)

STATUTORY AUTHORITY: KRS 224.10-100, 224.40-100(19)(c), (24), (28), 224.40-305

NECESSITY, FUNCTION, AND CONFORMITY: KRS 224.40-100(19)(c), (24), and (28) requires the cabinet to promulgate rules and administrative regulations for the permitting, management, processing, or disposal of wastes. KRS 224.40-305 requires that persons engaging in the management, processing, and disposal of waste obtain a permit. This administrative regulation establishes the biopile liner geosynthetic quality assurance and quality control testing requirements for solid waste petroleum-contaminated soil treatment facilities.

Section 1. Definitions.(1) "Certifying engineer" means "professional engineer," as defined by KRS 322.010(3), who implements the petroleum-contaminated soil treatment facility construction quality assurance plan.

(2) "Petroleum-contaminated soil" means silt, sand, clay, gravel, or other earthen material; or asphalt, concrete, or absorbent materials containing hydrocarbon concentrations above the levels established in 401 KAR 48:205, Section 6, Table 3, but does not exhibit a hazardous characteristic or is not a listed hazardous waste as defined in 401 KAR Chapter 31.

(3) "Petroleum-contaminated soil treatment facility" means a solid waste site or facility where petroleum-contaminated soil is treated to reduce contaminant concentrations to or below the levels established in 401 KAR 48:205, Section 6, Table 3.

(4) "Quality assurance" means the procedures that are initiated by the owner or operator and implemented by the professional engineer to ensure that the construction of the petroleum-contaminated soil treatment facility meet design specifications and performance requirements.

(5) "Quality control" means the system of control implemented by the manufacturer, fabricator, installer, construction contractor, operator, or other person in order to meet construction specifications for the construction of the petroleum-contaminated soil treatment facility.

Section 2. Applicability. (1) The quality assurance and quality control requirements of this administrative regulation apply to the construction of liner geosynthetics for biopiles at petroleum-contaminated soil treatment facilities.

(2) The biopile liner design requirements are established in 401 KAR 48:205, Section 3, for petroleum-contaminated soil treatment facilities.

Section 3. Specific Geosynthetic Clay Liner (GCL) Requirements for Bottom Liners. A Geosynthetic Clay Liner (GCL) is a low permeability man-made material having a maximum coefficient of permeability of  $5 \times 10^{-9}$  centimeters per second and is used to control fluid migration.

(1) Materials required. (a) The GCL shall have a demonstrated hydraulic conductivity less than  $5 \times 10^{-9}$  centimeters per second.

(b) 1. Documentation shall be submitted to ensure chemical compatibility of the wastes with the GCL; or

2. In the absence of the appropriate documentation, chemical compatibility testing shall be performed using the current version of ASTM D6141 Standard Guide for Screening Clay Portion of Geosynthetic Clay Liner (GCL) for Chemical Compatibility to Liquids; or similar method based on the applicable standards of practice as established in KRS 322.010(16) for certification by a professional engineer.

(2)(a) Construction requirements. A GCL shall be installed in accordance with the requirements of the approved engineering plans, reports, and specifications in the petroleum-contaminated soil treatment facility permit and manufacturer's recommendations.

(b) The certifying engineer shall ensure that the GCL installation, at a minimum, shall conform to the following:

1. The GCL shall meet the manufacturer's and professional engineer's specifications based on the Geosynthetic Research Institute (GRI) GRI-GCL3, Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs);

2. The GCL shall be installed on a biopile liner subgrade to promote positive drainage;

3. GCL installed on slopes shall be designed to withstand the calculated tensile forces acting upon the synthetic material and shall ensure that overall slope stability is maintained;

4. a. The surface of the supporting soil above which the GCL liner shall be installed shall be free of stones, organic matter, irregularities, protrusions, loose soil, and abrupt changes in grade that may damage the GCL; and

b. The supporting soil shall conform to the requirements established in 401 KAR 48:206, Section 5;

5. The anchor trench shall be excavated to the length and width prescribed on the approved design drawings in the permit;

6. a. Field seams shall be oriented parallel to the line of maximum slope, which is oriented along, not across the slope.

b. In corners and irregularly-shaped locations, the number of field seams shall be minimized;

7. The materials shall be overlapped using the appropriate method acceptable to the manufacturer;

8. The seam area shall be free of moisture, dust, dirt, debris, and foreign material before overlapping; and

9. Field seam overlapping shall be prohibited if the conditions, including precipitation and wind, do not meet the professional engineer's recommendations based upon the manufacturer's specifications.

(3) Certification requirements.

(a) The certifying engineer shall include in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, a discussion of the approved data resulting from the quality assurance and quality control testing required in this subsection.

(b) The results of testing shall be included in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, including documentation of failed test results, descriptions of the procedures used to correct the failed material, and statements of retesting performed.

(c) The certifying engineer shall certify, after review of the quality control testing of the GCL, that the material meets the requirements of the approved engineering plans, reports, and specifications in the petroleum-contaminated soil treatment facility permit. Before installing a GCL, the following information shall be available to the certifying engineer for approval:

1. Origin and identification of the raw materials used to manufacture the GCL;

2. Copies of quality control certificates issued by the producer of the raw materials used to manufacture the GCL; and

3. a. Reports of tests conducted by the manufacturer to verify the quality of the raw materials used to manufacture the GCL.

b. Tests shall be conducted for Bentonite Fluid Loss, Bentonite Mass per Area, Bentonite Swell Index, Grab Strength, Hydrated Internal Shear Strength, Hydraulic Conductivity, Index Flux and Peel Strength in accordance with GRI-GCL3, Test Methods, Required Properties, and

Testing Frequencies of Geosynthetic Clay Liners (GCLs), or other suitable tests based on the applicable standards of practice as established in KRS 322.010(16) for certification by a professional engineer.

(d) Quality assurance testing performed in the field under the supervision of the certifying engineer shall assure conformity of the GCL installation with the engineering plans, reports, and specifications submitted in accordance with the following requirements:

1. a. During the construction phase, the GCL shall be inspected for uniformity, damage, and imperfections.

b. The GCL shall be inspected for tears, punctures, or holes; and

c. All imperfections shall be repaired and reinspected; and

2. a. Tests conducted by the independent laboratory to verify the quality of the GCL received at the facility.

b. Tests shall be conducted for Grab Tensile Strength, Swell Index, Peel Strength, Bentonite Mass per Area in accordance with GRI-GCL3 Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs), or other appropriate test methods based on the applicable standards of practice as established in KRS 322.010(16) for certification by a professional engineer.

Section 4. Specific Synthetic Liner Requirements for Bottom Liners. A biopile synthetic liner shall comply with the requirements of 401 KAR 48:205, Section 3 and meet the following requirements:

(1) Materials required. (a) The synthetic liner material shall have a chemical and physical resistance not adversely affected by waste placement or leachate generated.

(b) 1. Documentation shall be submitted to ensure chemical compatibility of the synthetic liner material chosen; or

2. In the absence of the appropriate documentation, chemical compatibility testing shall be performed using EPA SW-846 test method 9090A, Compatibility Test for Wastes and Membrane Liners incorporated by reference in 401 KAR 48:205, Section 9; and

(2) Construction requirements.

(a) A biopile synthetic liner shall be installed in accordance with the requirements of the approved engineering plans, report, and specifications in the petroleum-contaminated soil treatment facility permit and manufacturer's recommendations.

(b) The certifying engineer shall ensure that the biopile synthetic liner installation, at a minimum, shall conform to the following:

1. The biopile synthetic liner shall have a nominal thickness of sixty (60) mils for liners;

2. The biopile synthetic liner shall be installed on a liner subgrade that promotes positive drainage;

3. The biopile synthetic liner installed on a slope shall be designed to withstand the calculated tensile forces acting upon the synthetic material and shall ensure that overall slope stability is maintained;

4. The surface of the supporting soil above which the biopile synthetic liner shall be installed shall be free of stones, organic matter, irregularities, protrusions, loose soil, and abrupt changes in grade that could damage the biopile synthetic liner;

5. The anchor trench shall be excavated to the length and width prescribed on the approved design drawings in the petroleum-contaminated soil treatment facility permit;

6. Field seams shall be oriented parallel to the line of maximum slope, which is, oriented along, not across the slope. In corners and irregularly-shaped locations, the number of field seams shall be minimized;

7. The materials shall be seamed using the appropriate method in the permit. Seam testing shall be performed in accordance with the requirements of Section 5 of this administrative regulation;

8. The seam area shall be free of moisture, dust, dirt, debris, and foreign material before seaming; and

9. Field seaming shall be prohibited if the conditions including ambient air, temperature, precipitation, or wind do not meet the professional engineer's recommendations based upon the manufacturer's specifications.

Section 5. Synthetic Liner Certification Requirements for Bottom Liners. (1) The certifying engineer shall include in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, a discussion of the reviewed data resulting from the quality assurance and quality control testing required in this section.

(2) The results of all testing shall be included in the form DEP 8064, Construction Progress Report for a Petroleum Contaminated Soil Treatment Facility, as incorporated by reference in 401 KAR 47:205, Section 10, including documentation of failed test results, descriptions of the procedures used to repair the failed material, and documentation of retesting performed.

(3) The certifying engineer shall certify, after review of the quality control testing of the biopile synthetic liner, if the material meets the requirements of the approved engineering plans, reports, and specifications in the permit.

(4) Before installing a biopile synthetic liner, the following information shall be available to the certifying engineer for approval:

(a) Origin and identification of the raw materials used to manufacture the biopile synthetic liner;

(b) Copies of quality control certificates issued by the producer of the raw materials used to manufacture the biopile synthetic liner; and

(c) Reports of the following tests conducted to verify the quality of the raw materials used to manufacture the biopile synthetic liner: tests for specific gravity, melt flow index, and percent carbon black shall be performed using GRI Test Method GM13, Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes.

(5) The certifying engineer shall verify through appropriate documentation that the quality control testing of the synthetic liner at the factory took place in accordance with the manufacturer's quality control plan, which is based on the appropriate GRI specifications based on the applicable standards of practice as established in KRS 322.010(16) for certification by a professional engineer.

(6) Quality assurance testing performed in the field under the supervision of the certifying engineer shall assure conformity of the biopile synthetic liner installation with the engineering plans, reports, and specifications submitted in accordance with the following requirements:

(a) During the construction phase, the biopile synthetic liner shall be inspected for uniformity, damage, and imperfections using the following procedures:

1. The biopile synthetic liner shall be inspected for tears, punctures, or blisters; and

2. All imperfections shall be repaired and reinspected;

(b) All field seams shall be nondestructively tested over their entire length using the air pressure test for double fusion seams or the vacuum test for other seams using the following procedures:

1. The certifying engineer shall be responsible for overseeing the accomplishment of nondestructive testing;

2. The contractor or test personnel shall do the following:
  - a. Record the location, date, test unit number, name of tester, and results of testing;
  - b. Inform the installer of required repairs; and
  - c. (i) Overlay seams that cannot be nondestructively tested with the same biopile synthetic liner; and  
(ii) The seaming and patching operation shall be inspected by the certifying engineer for uniformity and completeness; and  
(c)1. Destructive testing shall be performed on the synthetic liner seam sections using GRI Test Method GM19, Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.
    2. Seam samples for testing shall be taken as follows:
      - a. A minimum of one (1) test per every 500 feet of seam length unless a more frequent testing protocol is agreed upon by the installer and professional engineer; and
      - b. Additional test locations may be determined during seaming and shall be based on the applicable standards of practice as established in KRS 322.010(16) for certification by a professional engineer.
    3. Test locations shall be documented in the following manner:
      - a. The certifying engineer shall approve the sample size to be taken;
      - b. The sample size shall be predetermined as being large enough to perform the required testing; and
      - c. An independent laboratory shall perform the required testing that shall include, as a minimum, testing for seam strength and peel adhesion using GRI Test Method GM19 Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes.
    4. If a sample fails destructive testing, the certifying engineer shall ensure that:
      - a.(i) The seam shall be reconstructed between the location of the sample that failed and the location of the next acceptable sample; or  
(ii) The welding path shall be retraced to an intermediate location at least ten (10) feet from the location of the sample that failed the test, and new samples shall be taken for additional field tests; and  
b.(i) If both new samples pass testing, the seam shall then be reconstructed between the location of both new samples; and  
(ii) If a new sample fails, the process in this subparagraph shall be repeated.

Section 6. Incorporation by Reference. (1) The following material is incorporated by reference:

- (a) "ASTM D6141 Standard Guide for Screening Clay Portion of Geosynthetic Clay Liner (GCL) for Chemical Compatibility to Liquids", November 2009;
- (b) GRI-GCL3 "Test Methods, Required Properties, and Testing Frequencies of Geosynthetic Clay Liners (GCLs)", July 2010;
- (c) GRI Test Method GM13 "Test Methods, Test Properties and Testing Frequency for High Density Polyethylene (HDPE) Smooth and Textured Geomembranes for HDPE", July 2009; and
- (d) GRI Test Method GM19 "Seam Strength and Related Properties of Thermally Bonded Polyolefin Geomembranes", November 2010.

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(3) This material may also be obtained from the following organizations:

- (a) The material in subsection (1)(a) may be obtained at:

1. ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA, 19428-2959 USA; or

2. <http://www.astm.org/index.shtml>

(b) The material in subsection (1)(c) through (f) may be obtained at:

1. Geosynthetic Research Institute, 475 Kedron Avenue, Folsom, PA 19033-1208 USA; or

2. <http://www.geosynthetic-institute.org/> (37 Ky.R. 2792; 38 Ky.R. 562; eff. 10-6-11; TAm eff. 7-8-2016.)